

Table S1: Seroprevalence of neglected tropical diseases (NTDs), enteric protozoa, helminths, mosquito-borne diseases, and vaccine preventable diseases (VPDs), stratified by sex and age, Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024.

Disease (antigen)			Sex				Age (years)								P-value 1	P-value 2
	Total		Males		Females		5-10		11-19		20-50		>50			
	(n=1768)		(n=804)		(n=963)		(n=272)		(n=617)		(n=877)					
	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)		
Seropositive for NTDs																
Lymphatic filariasis (<i>WbI23</i>)	88	5 4.1-6.1	52	6.5 5.0-8.4	36	3.7 2.7-5.1	7	2 0.8-4.0	12	2.3 1.2-3.9	34	6.9 4.8-9.4	35	9.2 6.5-12.5	0.009	<0.001
Lymphatic filariasis (<i>BmI4</i>)	53	3 2.3-3.9	35	4.4 3.1-6.0	18	1.9 1.2-2.9	3	0.8 0.2-2.4	5	0.9 0.3-2.2	18	3.6 2.2-5.7	27	7.1 4.7-10.1	0.002	<0.001
Yaws (<i>TmpA</i> and <i>Rp17</i>) [∞]	1	0.2 0.0-1.2	1	0.3 0.0-2.2	0	-	1	0.3 0.04-2.0	-	-					1.000	1.000
Trachoma (<i>Pgp3</i>) [∞]	41	6.9 5.1-9.2	16	8.9 6.1-12.8	25	5.1 3.2-8.2	30	8.4 5.7-11.7	10	1.9 0.9-3.4					0.399	<0.001
Taeniasis (<i>Es33</i>)	8	0.5 0.2-0.9	3	0.4 0.1-1.2	5	0.5 0.2-1.2	1	0.3 0.0-2.0	3	0.6 0.2-1.7	4	0.8 0.3-2.1	0	-	0.65	0.321
Cysticercosis (<i>T24H</i>)	42	2.4 1.8-3.2	12	3.1 2.2-4.4	30	1.5 0.9-2.6	11	3.1 1.7-5.5	6	1.1 0.5-2.5	17	3.4 2.1-5.5	8	2.1 1.1-4.1	0.026	0.08
Strongyloidiasis (<i>SsIR</i>)	40	2.3 1.7-3.1	25	3.1 2.0-4.6	15	1.6 0.9-2.6	7	2 0.8-4.0	6	1.1 0.4-2.4	9	1.8 0.8-3.4	18	4.7 2.8-7.4	0.029	0.003
Seropositive for arboviruses																
Dengue (serotype DENV-1) <i>DengNS1 sero1</i>	1063	60.1 57.8-62.4	426	53 49.5-56.5	637	66.1 63.1-69.1	20	5.6 3.4-8.5	231	43.5 39.2-47.8	459	92.5 89.9-94.7	352	92.4 89.3-94.8	<0.001	<0.001
Dengue (serotype DENV-2) <i>DengNS2 sero2</i>	1020	57.7 55.4-60	403	50.1 46.6-53.6	617	64.1 60.9-67.1	40	11.2 8.1-14.9	225	42.4 38.1-46.7	403	81.3 77.5-84.6	351	92.1 89.0-94.6	<0.001	<0.001
Dengue (serotype DENV-3) <i>DengNS3 sero3</i>	1037	58.7 56.3-60.9	413	51.4 47.9-54.9	624	64.8 61.7-67.8	45	12.6 9.3-16.5	229	43.1 38.9-47.5	408	82.3 78.6-85.5	354	92.9 89.9-95.3	<0.001	<0.001
Dengue (serotype DENV-4) <i>DengNS4 sero4</i>	1201	67.9 65.7-70.1	500	62.2 58.7-65.6	700	72.7 69.8-75.5	36	10.1 7.1-13.6	312	58.8 54.4-63.0	481	97 95.1-98.3	370	97.1 94.9-98.6	<0.001	<0.001
Chikungunya (<i>Chik E1</i>)	599	33.9 31.7-36.1	241	30 26.8-33.3	357	37.1 34.0-40.2	6	1.7 0.6-3.6	214	40.3 36.1-44.6	245	49.4 44.9-53.9	133	34.9 30.1-39.9	0.002	<0.001
Zika (<i>Zika NS1</i>)	378	21.4 19.5-23.4	149	18.5 15.9-21.4	229	23.8 21.1-26.6	39	10.9 7.9-14.6	140	26.4 22.7-30.3	114	23 19.4-26.9	85	22.3 18.2-26.8	0.007	<0.001
Seropositive for VPDs																
SARS CoV2 (<i>RBD59I</i>) [‡]	1615	91.3 89.9-92.6	717	89.2 86.8-91.2	897	93.1 91.4-94.7	258	72.1 67.1-76.7	493	92.8 90.3-94.9	490	98.8 97.4-99.6	372	97.6 95.6-98.9	0.003	<0.001
SARS CoV2 (<i>Spike</i>) [‡]	1690	95.6 94.5-96.5	758	94.3 92.4-95.8	931	96.7 95.3-97.7	308	86 82.0-89.5	513	96.6 94.7-98.0	492	99.2 97.9-99.8	375	98.4 96.6-99.4	0.015	<0.001
SARS CoV2 (<i>N</i>) [‡]	650	36.8 34.5-39	283	35.2 31.9-38.6	366	38 34.9-41.2	94	26.3 21.8-31.1	184	34.7 30.6-38.9	209	42.1 37.7-46.6	161	42.3 37.2-47.4	0.223	<0.001
Measles virus 0.01 IU/mL [‡] (<i>MeV</i>)	1523	86.1 84.5-87.7	667	83 80.2-85.5	856	88.9 86.7-90.8	312	87.2 83.2-90.4	404	76.1 72.2-79.7	429	86.5 83.2-89.4	377	99 97.3-99.7	<0.001	0.001
Rubella virus 0.01 IU/mL [‡] (<i>RuV</i>)	1678	94.9 93.8-95.8	748	93 91.1-94.7	930	96.6 95.2-97.6	346	96.6 94.2-98.3	481	90.6 87.8-92.9	474	95.6 93.4-97.2	376	98.7 97.0-99.6	<0.001	0.001
Diphtheria toxoid 0.01/mL [‡] (<i>Dip</i>)	1265	71.5 69.4-73.6	582	72.4 69.2-75.5	683	70.9 67.9-73.8	302	84.4 80.2-88.0	380	71.6 67.5-75.4	347	70 65.7-74.0	235	61.7 56.6-66.6	0.497	<0.001
Tetanus toxoid 0.01 IU/mL [‡] (<i>Tet</i>)	1648	93.2 91.9-94.3	732	91 88.9-92.9	915	95 93.4-96.3	355	99.2 97.6-99.8	513	96.6 94.7-98.0	459	92.5 89.9-94.7	319	83.7 79.6-87.3	0.001	<0.001
Pertussis 5mIU/mL [‡] (<i>Pt</i>)	1542	87.2 85.6-88.7	707	87.9 85.5-90.1	834	86.6 84.3-88.7	325	90.8 87.3-93.6	459	86.4 83.2-89.2	416	83.9 80.3-87.0	340	89.2 85.7-92.2	0.404	0.013
Seropositive for enteric protozoa																
Cryptosporidium (<i>Cp17</i> or <i>Cp23</i>)	1147	64.9 62.6-67.1	493	61.3 57.9-64.6	653	67.8 64.8-70.7	146	40.8 35.8-46.0	275	51.8 47.5-56.0	375	75.6 71.6-79.2	349	91.6 88.4-94.0	0.005	<0.001
Giardiasis (<i>VSP3</i> or <i>VSP5</i>)	148	8.4 7.2-9.8	60	7.5 5.8-9.5	88	9.1 7.5-11.1	26	7.3 5.0-10.5	39	7.3 5.4-9.9	46	9.3 7.0-12.2	37	9.7 7.1-13.1	0.206	0.437

Table S2: Seroprevalence of neglected tropical diseases (NTDs), enteric protozoa, helminths, mosquito-borne diseases, and vaccine preventable diseases (VPDs), stratified by island group, Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024.

Disease (antigen)			Island group						P'-value
	Total		Tongatapu		Ha'apai		Ongo Niua		
	(n=1768)		(n=1,132)		(n=251)		(n=385)		
	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	
Seropositive for NTDs									
Lymphatic filariasis (Wb123)	88	5 4.1-6.1	19	1.7 1.1-2.6	33	13.1 9.5-17.9	36	9.4 6.8-12.7	<0.001
Lymphatic filariasis (Bm14)	53	3 2.3-3.9	6	0.5 0.2-1.2	22	8.8 5.8-13	25	6.5 4.4-9.4	<0.001
Yaws (TnpA and Rp17) [∞]	1	0.2 0.0-1.2	1	0.3 0.0-1.9	0	-	0	-	0.263
Trachoma (Pgp3) [∞]	41	6.9 5.1-9.2	22	5.9 3.9-8.9	11	12.1 6.8-20.5	8	6 3.0-11.6	0.135
Taeniasis (Es33)	8	0.5 0.2-0.9	7	0.6 0.3-1.3	0	-	1	0.3 0.0-1.8	0.34
Cysticercosis (T24H)	42	2.4 1.8-3.2	33	2.9 2.1-4.1	5	2.0 0.8-4.7	4	1.0 0.4-2.7	0.103
Strongyloidiasis (SsIR)	40	2.3 1.7-3.1	21	1.9 1.2-2.8	10	4 2.2-7.3	9	2.3 1.2-4.4	0.121
Seropositive for arboviruses									
Dengue (serotype DENV-1) DengNS1 sero1	1063	60.1 57.8-62.4	716	63.3 60.4-66	144	57.4 51.1-63.4	203	52.7 47.7-57.7	0.001
Dengue (serotype DENV-2) DengNS2 sero2	1020	57.7 55.4-60	715	63.2 60.3-65.9	123	49 42.8-55.2	182	47.3 42.3-52.3	<0.001
Dengue (serotype DENV-3) DengNS3 sero3	1037	58.7 56.3-60.9	726	64.1 61.3-66.9	127	50.6 44.4-56.8	184	47.8 42.8-52.8	<0.001
Dengue (serotype DENV-4) DengNS4 sero4	1201	67.9 65.7-70.1	798	70.5 67.8-73.1	163	64.9 58.8-70.6	240	62.3 57.4-67.1	0.007
Chikungunya (Chik E1)	599	33.9 31.7-36.1	452	39.9 37.1-42.8	72	28.7 23.4-34.6	75	19.5 15.8-23.8	<0.001
Zika (Zika NS1)	378	21.4 19.5-23.4	282	24.9 22.5-27.5	46	18.3 14-23.6	50	13 10-16.7	<0.001
Seropositive for VPDs									
SARS CoV2 (RBD591) [‡]	1615	91.3 89.9-92.6	1030	91 89.2-92.5	232	92.4 88.4-95.1	353	91.7 88.5-94.1	0.736
SARS CoV2 (Spike) [‡]	1690	95.6 94.5-96.5	1079	95.3 93.9-96.4	240	95.6 92.2-97.6	371	96.4 93.9-97.8	0.689
SARS CoV2 (N) [‡]	650	36.8 34.5-39	429	37.9 35.1-40.8	94	37.5 31.7-43.6	127	33 28.5-37.9	0.219
Measles virus 0.01 IU/mL [‡] (MeV)	1523	86.1 84.5-87.7	1002	88.5 86.5-90.2	213	84.9 79.8-88.8	308	80 75.7-83.7	<0.001
Rubella virus 0.01 IU/mL [‡] (RuV)	1678	94.9 93.8-95.8	1085	95.8 94.5-96.9	239	95.2 91.8-97.3	354	91.9 88.8-94.3	0.011
Diphtheria toxoid 0.01/mL [‡] (Dip)	1265	71.5 69.4-73.6	834	73.7 71-76.2	160	63.7 57.6-69.5	271	70.4 65.6-74.8	0.006
Tetanus toxoid 0.01 IU/mL [‡] (Tet)	1648	93.2 91.9-94.3	1081	95.5 94.1-96.6	220	87.6 82.9-91.2	347	90.1 86.7-92.7	<0.001
Pertussis 5mIU/mL [‡] (Pt)	1542	87.2 85.6-88.7	1081	95.5 94.1-96.6	211	84.1 79-88.1	250	64.9 60-69.6	<0.001
Seropositive for enteric protozoa									
Cryptosporidium (Cp17 or Cp23)	1147	64.9 62.6-67.1	755	66.7 63.9-69.4	163	64.9 58.8-70.6	229	59.5 54.5-64.3	0.038
Giardiasis (VSP3 or VSP5)	148	8.4 7.2-9.8	105	9.3 7.7-11.1	28	11.2 7.8-15.7	15	3.9 2.4-6.4	0.001

Table 3a: Logistic regression of demographic and behavioural factors associated with seropositivity to neglected tropical diseases, Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024. Light grey cells were not significant in the final multivariable model. Age associations were not estimated for trachoma as analysis was restricted to those aged ≤14 years only.

	Lymphatic filariasis				Trachoma [∞]		Yaws		Helminths					
	Wb123		Bm14		Pgp3		Rp17 & TmpA		Strongyloidiasis		Cysticercosis		Taeniasis	
	Ab-positive		Ab-positive		Ab-positive		Ab-positive		Ab-positive		Ab-positive		Ab-positive	
	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value
Age (years)														
5-10	REF		REF						REF		REF			
11-19	1.37	0.515	1.38	0.663					0.57	0.316	0.35	0.039		
20-50	3.84	0.002	4.59	0.016					1.06	0.915	1.01	0.97		
>50	6.48	<0.001	12.57	<0.001					2.72	0.027	0.59	0.27		
Sex														
Female	REF		REF						REF		REF			
Male	2.12	0.001	2.95	<0.001					2.23	0.016	0.50	0.048		
Island Group														
Tongatapu	REF		REF		REF						REF			
Ha’apai	8.62	<0.001	18.12	<0.001	2.16	0.048					0.62	0.33		
Ongo Niuas	6.51	<0.001	15.10	<0.001	1.12	0.784					0.32	0.034		

*No significant associations found for yaws or taeniasis.

Table 3b: Logistic regression of demographic and behavioural factors associated with seropositivity to arboviruses, Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024. Light grey cells were not significant in the final multivariable model. Age associations were not estimated for trachoma as analysis was restricted to those aged ≤14 years only.

	Arboviruses											
	Zika		Chikungunya		DENV-1		DENV-2		DENV-3		DENV-4	
	Ab-positive		Ab-positive		Ab-positive		Ab-positive		Ab-positive		Ab-positive	
	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value
Age (years)												
5-10	REF		REF		REF		REF		REF		REF	
11-19	2.88	<0.001	40.26	<0.001	13.18	<0.001	5.91	<0.001	5.32	<0.001	12.92	<0.001
20-50	2.39	<0.001	62.64	<0.001	253.81	<0.001	43.22	<0.001	40.62	<0.001	333.03	<0.001
>50	2.20	<0.001	30.60	<0.001	228.17	<0.001	110.51	<0.001	108.20	<0.001	325.42	<0.001
Sex												
Female	REF		REF		REF		REF		REF			
Male	0.72	0.008	0.79	0.041	0.68	0.006	0.64	<0.001	0.66	0.001		
Island Group												
Tongatapu	REF		REF		REF		REF		REF		REF	
Ha’apai	0.70	0.046	0.55	<0.001	0.39	<0.001	0.28	<0.001	0.29	<0.001	0.40	<0.001
Ongo Niuas	0.45	<0.001	0.31	<0.001	0.39	<0.001	0.34	<0.001	0.32	<0.001	0.47	<0.001

Table 3c: Logistic regression of demographic and behavioural factors associated with seropositivity to vaccine-preventable diseases (VPDs), Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024. Light grey cells were not significant in the final multivariable model.

	Vaccine-preventable diseases															
	SARS COV-2 (RDB51) Ab-positive		SARS COV-2 (Spike) Ab-positive		SARS COV-2 (N) Ab-positive		Diphtheria Ab-positive [#]		Tetanus Ab-positive [#]		Pertussis Ab-positive [#]		Measles Ab-positive		Rubella Ab-positive	
	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value	aOR	P- value
Age (years)																
5-10	REF		REF		REF		REF		REF		REF		REF		REF	
11-19	5.06	<0.001	4.63	<0.001	1.49	0.008	0.45	<0.001	0.22	0.02	0.53	0.007	0.44	<0.001	0.32	0.001
20-50	30.33	<0.001	19.97	<0.001	2.05	<0.001	0.44	<0.001	0.10	<0.001	0.52	0.005	0.90	0.631	0.69	0.32
>50	15.59	<0.001	10.15	<0.001	2.06	<0.001	0.29	<0.001	0.04	<0.001	0.68	0.147	12.94	<0.001	2.32	0.12
Sex																
Female									REF				REF		REF	
Male									0.43	<0.001			0.64	0.002	0.49	0.002
Island Group																
Tongatapu							REF		REF		REF		REF		REF	
Ha’apai							0.61	0.001	0.33	<0.001	0.24	<0.001	0.63	0.03	0.73	0.36
Ongo Niuas							0.81	0.113	0.37	<0.001	0.09	<0.001	0.49	<0.001	0.45	0.001

Table 3d: Logistic regression of demographic and behavioural factors associated with seropositivity to enteric protozoa, Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024. Light grey cells were not significant in the final multivariable model.

	Enteric protozoa			
	Cryptosporidium Ab-positive		Giardiasis Ab-positive	
	aOR	P- value	aOR	P- value
Age (years)				
5-10	REF			
11-19	1.53	0.002		
20-50	4.58	<0.001		
>50	15.69	<0.001		
Sex				
Female				
Male				
Island Group				
Tongatapu	REF		REF	
Ha’apai	0.81	0.195	1.23	0.36
Ongo Niuas	0.72	0.013	0.40	0.001

Table 4a: Adjusted predicted probabilities of antigen positivity by island group, sex, and age. Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024.

			Wb123		Bm14		Zika		Chikungunya		DENV-1		DENV-2		DENV-3		Measles		Rubella		Cysticercosis	
Island group	Sex	Age group (years)	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value
Tongatapu	Male	5–10	0.19 (-0.07-0.45)	0.159	0.81 (0.1-1.51)	0.024	11.29 (7.64-14.94)	<0.001	1.94 (0.38-3.49)	0.015	6.03 (3.31-8.76)	<0.001	12.2 (8.32-16.09)	<0.001	13.97 (9.8-18.15)	<0.001	87.98 (84.18-91.77)	<0.001	96.65 (94.59-98.71)	<0.001	2.7 (0.71-4.7)	0.008
		11–19	0.26 (-0.04-0.57)	0.094	1.11 (0.33-1.89)	0.005	26.82 (22.17-31.46)	<0.001	44.29 (39-49.59)	<0.001	45.83 (40.09-51.57)	<0.001	45.08 (39.57-50.59)	<0.001	46.34 (40.81-51.87)	<0.001	76.43 (71.83-81.02)	<0.001	90.14 (86.8-93.48)	<0.001	0.95 (0.08-1.82)	0.032
		20–50	0.87 (0.05-1.69)	0.038	3.03 (1.28-4.79)	0.001	23.3 (18.28-28.32)	<0.001	55.3 (49.12-61.48)	<0.001	94.22 (91.97-96.46)	<0.001	85.73 (81.89-89.57)	<0.001	86.84 (83.19-90.49)	<0.001	86.88 (83.02-90.73)	<0.001	95.21 (92.76-97.67)	<0.001	2.74 (0.74-4.74)	0.007
		>50	2.34 (0.36-4.32)	0.021	5.02 (2.36-7.68)	<0.001	21.84 (16.83-26.85)	<0.001	37.67 (31.55-43.78)	<0.001	93.61 (91.01-96.2)	<0.001	93.89 (91.45-96.32)	<0.001	94.62 (92.36-96.87)	<0.001	98.96 (97.92-99.99)	<0.001	98.53 (97.19-99.87)	<0.001	1.61 (0.22-3.01)	0.023
	Female	5–10	0.06 (-0.03-0.16)	0.179	0.38 (0.03-0.73)	<0.001	14.93 (10.36-19.51)	<0.001	2.43 (0.49-4.36)	0.014	8.62 (4.87-12.36)	<0.001	17.9 (12.66-23.15)	<0.001	19.85 (14.4-25.3)	<0.001	91.95 (89.1-94.79)	<0.001	98.32 (97.17-99.47)	<0.001	5.27 (1.89-8.65)	0.002
		11–19	0.09 (-0.02-0.2)	0.116	0.52 (0.13-0.92)	0.010	33.58 (28.26-38.89)	<0.001	50.03 (44.5-55.56)	<0.001	55.41 (49.35-61.46)	<0.001	56.29 (50.57-62.02)	<0.001	56.84 (51.12-62.56)	<0.001	83.5 (79.57-87.42)	<0.001	94.88 (92.65-97.11)	<0.001	1.89 (0.3-3.47)	0.020
		20–50	0.3 (0-0.59)	0.053	1.45 (0.57-2.34)	0.001	29.53 (24.51-34.55)	<0.001	60.91 (55.65-66.16)	<0.001	95.99 (94.4-97.58)	<0.001	90.41 (87.74-93.08)	<0.001	90.96 (88.38-93.53)	<0.001	91.17 (88.51-93.84)	<0.001	97.58 (96.26-98.9)	<0.001	5.35 (2.62-8.07)	0.000
		>50	0.8 (0.07-1.54)	0.032	2.43 (1.06-3.8)	0.001	27.82 (22.46-33.19)	<0.001	43.21 (37.32-49.1)	<0.001	95.56 (93.7-97.42)	<0.001	96.02 (94.37-97.66)	<0.001	96.4 (94.85-97.95)	<0.001	99.33 (98.66-100)	<0.001	99.27 (98.58-99.96)	<0.001	3.18 (0.91-5.45)	0.006
Ha’apai	Male	5–10	3.34 (-0.57-7.24)	0.094	6.57 (1.49-11.65)	0.011	8.16 (4.67-11.66)	<0.001	1.08 (0.16-2.01)	0.022	2.43 (0.98-3.89)	0.001	3.79 (1.99-5.6)	<0.001	4.52 (2.43-6.62)	<0.001	82.09 (75.27-88.91)	<0.001	95.49 (92.04-98.95)	<0.001	1.7 (-0.15-3.54)	0.072
		11–19	4.55 (0.26-8.84)	0.038	8.8 (3.29-14.31)	0.002	20.38 (14.1-26.66)	<0.001	30.59 (23.15-38.02)	<0.001	24.72 (16.56-32.89)	<0.001	18.89 (12.8-24.98)	<0.001	20.13 (13.72-26.53)	<0.001	67.01 (57.77-76.24)	<0.001	87.04 (79.64-94.43)	<0.001	0.59 (-0.15-1.33)	0.117
		20–50	13.68 (6.18-21.18)	<0.001	21.24 (12.73-29.76)	<0.001	17.5 (11.82-23.19)	<0.001	40.67 (32.36-48.99)	<0.001	86.35 (80.67-92.03)	<0.001	63.02 (54.16-71.88)	<0.001	65.81 (57.16-74.47)	<0.001	80.57 (73.77-87.37)	<0.001	93.59 (89.37-97.81)	<0.001	1.72 (-0.12-3.56)	0.067
		>50	30.26 (17.58-42.94)	<0.001	31.3 (20.09-42.51)	<0.001	16.33 (10.68-21.98)	<0.001	25.09 (18.12-32.05)	<0.001	85.04 (78.49-91.6)	<0.001	81.33 (74.11-88.56)	<0.001	83.68 (76.96-90.4)	<0.001	98.34 (96.64-100.04)	<0.001	98.01 (95.9/-100.05)	<0.001	1.01 (-0.19-2.21)	0.099
	Female	5–10	1.16 (-0.3-2.62)	0.121	3.21 (0.51-5.9)	0.020	10.92 (6.4-15.44)	<0.001	1.36 (0.2-2.52)	0.021	3.53 (1.47-5.59)	0.001	5.83 (3.15-8.5)	<0.001	6.74 (3.73-9.74)	<0.001	87.73 (82.53-92.93)	<0.001	97.73 (95.84-99.62)	<0.001	3.34 (-0.09-6.77)	0.056
		11–19	1.59 (-0.08-3.25)	0.061	4.35 (1.3-7.4)	0.005	26.09 (18.56-33.62)	<0.001	35.69 (27.47-43.91)	<0.001	32.54 (22.87-42.21)	<0.001	26.76 (18.94-34.59)	<0.001	27.76 (19.73-35.79)	<0.001	76.01 (68.08-83.95)	<0.001	93.16 (88.65-97.66)	<0.001	1.18 (-0.24-2.6)	0.104
		20–50	5.09 (1.66-8.53)	0.004	11.28 (6-16.56)	<0.001	22.64 (16.18-29.1)	<0.001	46.34 (38.18-54.49)	<0.001	90.28 (86.1-94.46)	<0.001	72.78 (65.43-80.13)	<0.001	74.59 (67.47-81.71)	<0.001	86.62 (81.66-91.58)	<0.001	96.74 (94.46-99.01)	<0.001	3.39 (0.23-6.55)	0.036
		>50	12.82 (5.45-20.18)	0.001	17.68 (9.82-25.54)	<0.001	21.21 (14.57-27.85)	<0.001	29.66 (22.15-37.18)	<0.001	89.31 (84.4-94.22)	<0.001	87.24 (81.93-92.55)	<0.001	88.66 (83.7-93.62)	<0.001	98.93 (97.82-100.04)	<0.001	99.01 (97.96-100.06)	<0.001	2 (-0.18-4.18)	0.072
Ongo Niuas	Male	5–10	2.8 (-0.44-6.04)	0.091	5.04 (1.14-8.93)	0.011	5.38 (3.06-7.69)	<0.001	0.61 (0.09-1.14)	0.022	2.42 (1.08-3.76)	<0.001	4.48 (2.54-6.41)	<0.001	5.01 (2.91-7.11)	<0.001	78.11 (71.28-84.93)	<0.001	92.8 (88.33-97.28)	<0.001	0.89 (-0.16-1.94)	0.097
		11–19	3.82 (0.34-7.3)	0.032	6.79 (2.64-10.94)	0.001	14.06 (9.68-18.43)	<0.001	19.89 (14.74-25.05)	<0.001	24.62 (17.88-31.36)	<0.001	21.68 (15.98-27.37)	<0.001	21.91 (16.16-27.66)	<0.001	61.25 (53.27-69.23)	<0.001	80.33 (72.87-87.78)	<0.001	0.31 (-0.1-0.71)	0.136
		20–50	11.66 (5.39-17.93)	<0.001	16.91 (9.99-23.83)	<0.001	11.94 (7.91-15.97)	<0.001	27.87 (21.32-34.42)	<0.001	86.29 (81.13-91.44)	<0.001	66.95 (59.4-74.5)	<0.001	68.19 (60.72-75.65)	<0.001	76.35 (69.59-83.1)	<0.001	89.88 (84.76-95.01)	<0.001	0.9 (-0.16-1.96)	0.095
		>50	26.55 (15.06-38.05)	<0.001	25.59 (15.73-35.45)	<0.001	11.09 (7.06-15.13)	<0.001	15.88 (11.02-20.73)	<0.001	84.98 (78.84-91.11)	<0.001	83.82 (77.62-90.01)	<0.001	85.1 (79.12-91.08)	<0.001	97.88 (95.76-100)	<0.001	96.77 (93.76-99.78)	<0.001	0.53 (-0.16-1.21)	0.130
	Female	5–10	0.96 (-0.24-2.17)	0.115	2.44 (0.41-4.47)	0.018	7.27 (4.26-10.28)	<0.001	0.77 (0.12-1.42)	0.021	3.51 (1.64-5.38)	<0.001	6.85 (4.07-9.64)	<0.001	7.45 (4.51-10.38)	<0.001	84.77 (79.51-90.03)	<0.001	96.32 (93.81-98.82)	<0.001	1.76 (-0.2-3.73)	0.079
		11–19	1.33 (-0.02-2.67)	0.053	3.32 (1.07-5.56)	0.004	18.41 (13.06-23.76)	<0.001	23.82 (17.97-29.68)	<0.001	32.42 (24.7-40.14)	<0.001	30.28 (23.36-37.2)	<0.001	29.96 (23.06-36.86)	<0.001	71.15 (64.15-78.16)	<0.001	89.23 (84.29-94.16)	<0.001	0.62 (-0.16-1.39)	0.120
		20–50	4.28 (1.48-7.08)	0.003	8.76 (4.71-12.8)	<0.001	15.76 (11.14-20.38)	<0.001	32.73 (26.17-39.3)	<0.001	90.23 (86.55-93.92)	<0.001	76.07 (70.22-81.92)	<0.001	76.57 (70.76-82.38)	<0.001	83.43 (78.59-88.28)	<0.001	94.74 (91.96-97.52)	<0.001	1.79 (-0.07-3.65)	0.059
		>50	10.91 (4.64-17.18)	0.001	13.95 (7.57-20.32)	<0.001	14.68 (9.87-19.5)	<0.001	19.2 (13.87-24.54)	<0.001	89.26 (84.75-93.76)	<0.001	89.04 (84.64-93.44)	<0.001	89.7 (85.4-94)	<0.001	98.63 (97.25-100.01)	<0.001	98.38 (96.84-99.93)	<0.001	1.05 (-0.2-2.3)	0.101

Table 4b: Adjusted predicted probabilities of antigen positivity by island group and age. Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024.

		DENV-4		Cryptosporidium		Diphtheria		Pertussis	
Island group	Age group (years)	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value
Tongatapu	5–10	12.52 (8.64-16.41)	<0.001	43.38 (37.81-48.95)	<0.001	86.05 (82.43-89.66)	<0.001	97.18 (95.93-98.44)	<0.001
	11–19	64.69 (60.05-69.34)	<0.001	54.03 (49.46-58.6)	<0.001	73.54 (69.59-77.49)	<0.001	94.78 (93.06-96.5)	<0.001
	20–50	97.98 (96.9-99.07)	<0.001	77.82 (73.87-81.78)	<0.001	72.92 (68.65-77.2)	<0.001	94.7 (92.89-96.51)	<0.001
	>50	97.92 (96.65-99.19)	<0.001	92.32 (89.68-94.96)	<0.001	64.35 (59.3-69.4)	<0.001	95.93 (94.31-97.55)	<0.001
Ha’apai	5–10	5.5 (2.71-8.29)	<0.001	38.32 (30.34-46.31)	<0.001	78.95 (72.81-85.08)	<0.001	89.4 (84.76-94.03)	<0.001
	11–19	42.69 (32.01-53.38)	<0.001	48.8 (40.67-56.93)	<0.001	62.83 (55.44-70.22)	<0.001	81.61 (75.3-87.92)	<0.001
	20–50	95.18 (92.38-97.99)	<0.001	74 (67.73-80.27)	<0.001	62.09 (55.01-69.18)	<0.001	81.37 (75.44-87.31)	<0.001
	>50	95.04 (91.8-98.28)	<0.001	90.69 (86.94-94.45)	<0.001	52.33 (44.38-60.28)	<0.001	85.21 (79.47-90.95)	<0.001
Ongo Niuas	5–10	6.44 (3.69-9.19)	<0.001	35.5 (28.88-42.11)	<0.001	83.33 (78.55-88.1)	<0.001	74.82 (67.32-82.32)	<0.001
	11–19	46.83 (38.7-54.97)	<0.001	45.78 (39.22-52.33)	<0.001	69.25 (63.42-75.08)	<0.001	60.99 (53.59-68.4)	<0.001
	20–50	95.89 (93.65-98.14)	<0.001	71.6 (65.99-77.2)	<0.001	68.58 (62.78-74.38)	<0.001	60.62 (53.51-67.74)	<0.001
	>50	95.77 (93.11-98.44)	<0.001	89.62 (85.77-93.47)	<0.001	59.39 (52.33-66.46)	<0.001	67 (58.54-75.46)	<0.001

Table 4c: Adjusted predicted probabilities of antigen positivity by island group and sex. Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024.

		Cysticercosis	
Island group	Sex	Predicted probability (95% CI)	P-value
Tongatapu	Male	1.82 (0.76-2.88)	<0.001
	Female	3.86 (2.38-5.34)	<0.001
Ongo Niuas	Male	1.24 (0.01-2.48)	0.049
	Female	2.65 (0.31-4.99)	0.027
Ha’apai	Male	0.63 (-0.06-1.32)	0.074
	Female	1.35 (0.02-2.68)	0.047

Table 4d: Adjusted predicted probabilities of antigen positivity by age and sex. Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024.

		Strongyloidiasis	
Sex	Age group (years)	Predicted probability (95% CI)	P-value
Male	5–10	2.64 (0.65-4.64)	0.009
	11–19	1.52 (0.28-2.76)	0.016
	20–50	2.79 (0.83-4.75)	0.005
	>50	6.89 (3.39-10.38)	<0.001
Female	5–10	1.2 (0.16-2.25)	0.024
	11–19	0.69 (0.05-1.32)	0.034
	20–50	1.27 (0.33-2.21)	0.008
	>50	3.21 (1.3-5.11)	0.001

Table 4e: Adjusted predicted probabilities of antigen positivity by age. Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024.

	SARS COV-2 (RBD591)		SARS COV-2 (Spike)		SARS COV-2 (N)	
Age group (years)	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value
5–10	72.07 (67.42-76.71)	<0.001	86.03 (82.44-89.62)	<0.001	26.26 (21.7-30.82)	<0.001
11–19	92.84 (90.65-95.04)	<0.001	96.61 (95.07-98.15)	<0.001	34.65 (30.6-38.7)	<0.001
20–50	98.79 (97.83-99.75)	<0.001	99.19 (98.41-99.98)	<0.001	42.14 (37.79-46.48)	<0.001
>50	97.64 (96.11-99.16)	<0.001	98.43 (97.18-99.68)	<0.001	42.26 (37.3-47.22)	<0.001

Table 4f: Adjusted predicted probabilities of antigen positivity by island group. Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024.

	Trachoma		Giardiasis	
Island group	Predicted probability (95% CI)	P-value	Predicted probability (95% CI)	P-value
Tongatapu	6.13 (3.65-8.61)	<0.001	9.28 (7.59-10.97)	<0.001
Ha'apai	12.36 (5.52-19.2)	<0.001	11.16 (7.26-15.05)	<0.001
Ongo Niuas	6.84 (2.26-11.41)	0.003	3.9 (1.96-5.83)	<0.001

Table S5: Intraclass correlation coefficients for clustering at the island group and village levels for neglected tropical diseases, enteric protozoa, helminths, arboviruses, and vaccine-preventable diseases. Tonga Operational Research for Post-validation Surveillance for Elimination of Lymphatic Filariasis 2024.

	Island level				Village level				
Disease (antigen)	ICC	SE	95% CI		ICC	SE	95% CI		P-value
Seropositive for NTDs									
Lymphatic filariasis (<i>Wb123</i>)	0.27	0.20	0.05	0.73	0.55	0.15	0.27	0.81	<0.001
Lymphatic filariasis (<i>Bm14</i>)	0.14	0.14	0.02	0.60	0.42	0.12	0.22	0.66	<0.001
Trachoma (Pgp3) [∞]	0.00	-	-	1.00	0.02	0.01	0.00	0.07	0.018
Taeniasis (<i>Es33</i>)	0.00	0.00	-	1.00	0.27	0.28	0.02	0.86	0.115
Cysticercosis (<i>T24H</i>)	0.03	0.06	0.00	0.54	0.03	0.06	0.00	0.54	0.164
Strongyloidiasis (<i>SsIR</i>)	0.00	0.03	0.00	1.00	0.00	0.03	0.00	1.00	0.458
Seropositive for arboviruses									
Dengue (serotype DENV-1) <i>DengNS1 sero1</i>	0.03	0.03	0.00	0.18	0.04	0.03	0.01	0.18	<0.001
Dengue (serotype DENV-2) <i>DengNS2 sero2</i>	0.06	0.05	0.01	0.28	0.07	0.05	0.02	0.27	<0.001
Dengue (serotype DENV-3) <i>DengNS3 sero3</i>	0.07	0.05	0.01	0.28	0.07	0.05	0.01	0.28	<0.001
Dengue (serotype DENV-4) <i>DengNS4 sero4</i>	0.03	0.03	0.00	0.18	0.04	0.04	0.01	0.22	0.003
Chikungunya (<i>Chik E1</i>)	0.04	0.04	0.00	0.29	0.14	0.05	0.06	0.27	<0.001
Zika (<i>Zika NS1</i>)	0.02	0.02	0.00	0.14	0.02	0.02	0.00	0.14	<0.001
Seropositive for VPDs									
SARS CoV2 (<i>RBD591</i>) [‡]	0.00	-	-	1.00	0.01	0.02	0.00	0.37	0.269
SARS CoV2 (<i>Spike</i>) [‡]	0.00	-	-	1.00	0.05	0.06	0.00	0.39	0.156
SARS CoV2 (<i>N</i>) [‡]	0.00	-	-	1.00	0.01	0.01	0.00	0.05	0.083
Measles virus 0.01 IU/mL [‡] (<i>MeV</i>)	0.03	0.03	0.00	0.16	0.04	0.03	0.01	0.16	0.002
Rubella virus 0.01 IU/mL [‡] (<i>RuV</i>)	0.02	0.04	0.00	0.46	0.09	0.06	0.02	0.28	0.009
Diphtheria toxoid 0.01/mL [‡] (<i>Dip</i>)	0.07	0.06	0.01	0.31	0.07	0.06	0.01	0.31	<0.001
Tetanus toxoid 0.01 IU/mL [‡] (<i>Tet</i>)	0.01	0.01	0.00	0.10	0.01	0.01	0.00	0.07	0.164
Pertussis 5mIU/mL [‡] (<i>Pt</i>)	0.24	0.16	0.05	0.64	0.31	0.15	0.11	0.64	<0.001
Seropositive for enteric protozoa									
Cryptosporidium (<i>Cp17</i> or <i>Cp23</i>)	0.01	0.01	0.00	0.06	0.01	0.01	0.00	0.06	0.056
Giardiasis (<i>VSP3</i> or <i>VSP5</i>)	0.00	-	-	1.00	0.06	0.03	0.02	0.17	0.001